

## CLAIMS

What is claimed is:

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P2
- 10047332.011402
1. A device comprising:  
a voltage-controlled oscillator (VCO) circuit, the VCO circuit including
    - a) a variable capacitor for coarsely tuning the VCO circuit, the variable capacitor providing one of a plurality of capacitance values, each of the plurality of capacitance values corresponding to a distinct frequency band, each of the plurality of capacitance values providing a frequency/voltage characteristic for the VCO that is sufficiently linear to implement direct modulation for the frequency band,
    - b) a varactor for fine tuning the VCO circuit,
    - c) a series capacitor having a capacitance value to linearize a frequency/voltage characteristic of the varactor sufficient to implement direct modulation for a specified channel frequency within the frequency band.
  - ✓ 2. The device of claim 1, wherein the variable capacitor is a plurality of switchable capacitors, each capacitor coupled to a binary switch that allows the capacitor to be turned on or off.
  - ✓ 3. The device of claim 2, wherein the plurality of capacitance values comprises sixteen capacitance values, each capacitance value corresponding to one of sixteen frequency bands.
  - ✓ 4. The device of claim 3, wherein the sixteen frequency bands cover a frequency range of 2200Mhz to 2700Mhz.
  - ✓ 5. The device of claim 4, wherein the specified channel frequency is a frequency selected from the group consisting of  $2402\text{Mhz} + n\text{Mhz}$ , where  $n$  is an integer from 0 to 78.
  - ✓ 6. The device of claim 3, wherein the VCO circuit is implemented as an integrated circuit.

✓ 7. The device of claim 6, wherein the series capacitor is a metal-insulator-metal type capacitor.

✓ 8. The device of claim 1 further comprising:  
at least one resistor to couple an input voltage to the VCO circuit, the at least one resistor dampening external noise.

9. The device of claim 8, wherein the input voltage comprises a reference voltage and a control voltage.

10. The device of claim 9, wherein the reference voltage is used to bias a diode of the varactor to a desired bias point.

11. The device of claim 10, wherein the series capacitor isolates the reference voltage.

12. A system comprising:

✓ a phase comparator circuit;

✓ a charge pump;

✓ a loop filter circuit;

a fractional- $n$  frequency divider; and

✓ a voltage controlled oscillator (VCO) circuit, the VCO circuit including

a) a variable capacitor for coarsely tuning the VCO circuit, the variable capacitor providing one of a plurality of capacitance values, each of the plurality of capacitance values corresponding to a distinct frequency band, each of the plurality of capacitance values providing a frequency/voltage characteristic for the VCO that is sufficiently linear to implement direct modulation for the frequency band,

b) a varactor for fine tuning the VCO circuit,

c) a series capacitor having a capacitance value to linearize a frequency/voltage characteristic of the varactor sufficient to implement direct modulation for a specified channel frequency within the frequency band.

✓ 13. The system of claim 12, wherein the variable capacitor is a plurality of switchable capacitors, each capacitor coupled to a binary switch that allows the capacitor to be turned on or off.

X 14. The system of claim 13, wherein the plurality of capacitance values comprises sixteen capacitance values, each capacitance value corresponding to one of sixteen frequency bands.

X 15. The system of claim 14, wherein the sixteen frequency bands cover a frequency range of 2200Mhz to 2700Mhz.

X 16. The system of claim 15, wherein the specified channel frequency is a frequency selected from the group consisting of  $2402\text{Mhz} + n\text{Mhz}$ , where  $n$  is an integer from 0 to 78.

X 17. The system of claim 14, wherein the VCO circuit is implemented as an integrated circuit.

✓ 18. The system of claim 17, wherein the series capacitor is a metal-insulator-metal type capacitor.

19. The system of claim 12 further comprising:  
at least one resistor to couple an input voltage to the VCO circuit, the at least one resistor dampening external noise.

(20. The system of claim 19, wherein the input voltage comprises a reference voltage and a control voltage.

(21. The system of claim 20, wherein the reference voltage is used to bias a diode of the varactor to a desired bias point.

(22. The system of claim 21, wherein the series capacitor isolates the reference voltage.